Process control across the pond

John Naylor looks at how the internet is giving chem eng students in the UK a unique opportunity to experiment on equipment located thousands of miles away at MIT

CHEMICAL engineering students at Cambridge University have been testing their process control knowledge through a unique form of distance learning; running experiments on a heat exchanger located in a laboratory 3000 miles across the Atlantic ocean.

The experiments, in partnership with the Massachusetts Institute of Technology, are designed to supplement the students' studies with experience of controlling a real-life piece of equipment whilst also providing an opportunity to do so remotely with access to state-of-the-art software and equipment.

"This is a modern component to education," explains Markus Kraft, a chemical engineering lecturer at Cambridge University. "It is important for students to have this exposure to automated control experiments, especially if they choose to go into industry."

Motivation for the project was given by the Cambridge-MIT Institute (CMI), a government-funded body set up to promote competition, productivity and entrepreneurship in UK industry. In 1999, under an MIT partnership with Microsoft, a number of remote online laboratory experiments were set up. One of these 'i-labs' was initially run for chemical engineering students at MIT from 2001. Two years later, in November 2003, a proposal was accepted to allow Cambridge students access to the same piece of kit via the internet.

The Cambridge chem eng students get to grips with process control over the intenet

The project is ongoing, but has just completed its first year of operation at Cambridge where access for a large number of students is encouraged. "Students in their second and third years have an opportunity to use the equipment," says Kraft. "In the first year of chemical engineering studies, the project forms part of the fluids lab. In the following year there is an exercise devoted to the web-lab, where students have the chance to get more involved with the software and the equipment."

Despite the distances involved, it seems the experiment was a not difficult arrange. "It's not rocket science," explains Kraft's colleague Anders Selmer. "Setting up the experiment, even across the Atlantic, is quite simple. All you need is the experimental equipment, in this case a heat exchanger that is connected electronically to a computer, and a piece of software to control it." What is more, students do not require state-of-the-art computer equipment to control the experiment, and are even able to log on to a session using a simple dial-up connection from their home PCs.

The experiments use a powerful piece of graph-based software called Labview, developed by National Instruments. "Labview is widely used in industry, particularly in pharmaceutical research. It contains a web interface which is often run over a company intranet, and there is really little difference in running the package over the internet," Selmer says.

Kraft believes this is the only experiment of its type to be run over such a distance. Along with Selmer, he is confident of the benefit this provides to the students. "At the same time as teaching fundamental skills, we are also exposing students to a web interface and control software that is widely used within industry," says Selmer. "It also provides experience of communicating and performing experiments with others, without physically having them there. This aspect of communication may often present itself in industry," adds Kraft.

The reaction of students has also been positive. Kraft says that previous control experiments have not given students the same levels of interaction; "...students feel they can play around a bit more with this equipment."

However, Kraft remains mindful of the role that conventional studies play: "We don't want to replace hands-on experiments, which may be more important. Students will always need practical experience and confrontation with a rig."

Aside from the obvious benefits to students, one of the chief reasons for conducting the online project, and the main reason why additional experiments are being mooted for the near future, is the economic synergies that can be made by sharing equipment. "One of the main advantages is that it allows us to make more efficient use of equipment," Selmer explains. "It is not uncommon to have equipment that is only used for two weeks in a year. The project also allows both sides to make use of equipment we don't have."

With the ease at which such projects can be set up, it may not be long before more universities are using similar collaborations for mutual financial benefit; especially in the field of teaching, where the technology could conceivably be used to hold various inter-university distance learning programmes.

The next stage of the project is a reciprocal venture by Cambridge University to provide online experiments for MIT students. An experiment on reaction kinetics is planned, which will allow students to work on a chemical reactor where they will be able to analyse mixing, reaction rates and dimensioning the reactor vessel. Phase two is due to be introduced in the next academic year. ■

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